Tabletop mixed radiation source from liquid target via extreme light interactions

Anil K Patnaik

Air Force Institute of Technology, AFIT/ENP, 2950 Hobson Way, Wright-Patterson AFB, USA

Over-dense matter in relativistic laser-plasma interactions (RLPIs) present an exciting and innovative topic in high field physics, which offers significant promise to advance fundamental knowledge of dense plasmas and develop new sources of energetic particles and radiation. In the interaction of an ultra-intense laser pulse with over-dense matter, electrons are rapidly ionized and accelerated to a significant fraction of the speed of light (> MeV energies) in less than a single optical cycle, producing a broadband bremsstrahlung and narrow k-shell X-rays, and creating a bright source of light spanning from optical to gamma rays; They also help MeV-scale ion acceleration. The resulting generation of energetic radiation and particles creates a single, compact, table-top source of electrons, ions, positrons, neutrons, XUV, X-ray, gamma radiation, and even neutron generation, which offer a small footprint and a cost-effective source with ultrashort pulse duration capability.

We will present how our ability to dynamically generate different target shapes enhance our ability to reach high-density plasma regime, leading up to the unique radiation source from kHz-repetition-rate compatible liquid targets via its interaction with ultrashort lasers at our extreme light laboratory.